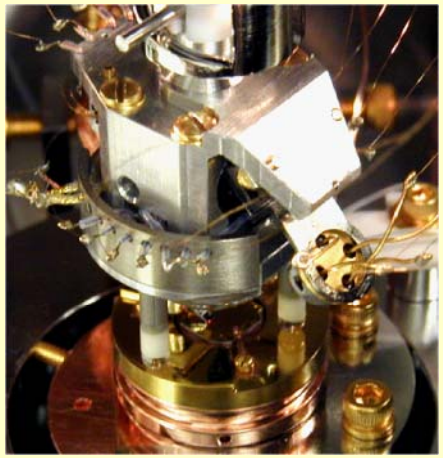
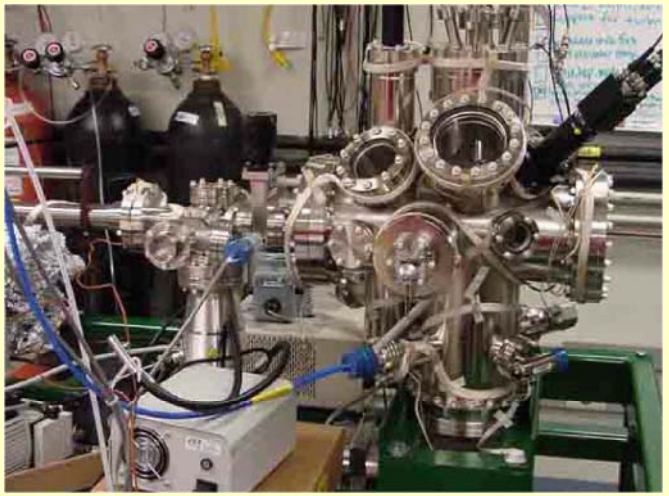
IMR Program: Acquisition of an Advanced Atomic Force Microscope for Research and Education in Nanomechanics and Nanotribology

R.W. Carpick, PI, University of Wisconsin - Madison

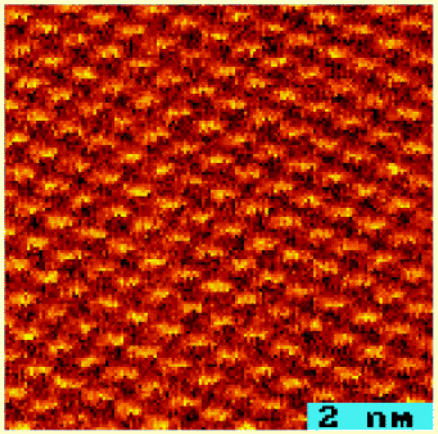


stand-alone AFM head

- **Capabilities:**
  - –high resolution atomic force microscopy (atomic scale studies of friction, surface topography, mechanical properties, nanomanipulation, nanostructures)
  - –ultrahigh vacuum (pristine surfaces for fundamental scientific studies)
  - –variable temperature (huge array of systems and physical effects can be studied)



UHV AFM system at UW-Madison



atomic stick-slip friction image of NaCl(001) in UHV

- **Novel Experiments and Ideas:**
  - –nanomanipulation of phosphate nanoparticles
  - –temperature effects in nanoscale friction
  - –MEMS surfaces: structure, friction, adhesion
  - –structure of magnetic oxide thin films
  - –isotope effects in nanoscale friction

Outreach Website:
http://mandm.engr.wisc.edu/UHVAFM

Personnel, Mentoring

- *Rob Carpick*, PI, Assistant Professor, Engineering Physics
- *Rachel Cannara*, Graduate Student, Physics
- *Erin Schmidt*, NSF REU student, Engineering Mechanics
- *Tom Kopriva*, Freshman Undergraduate, Engineering Mechanics
- *Christopher Bonifas*, Undergraduate, Materials Science (Senior Thesis project)

Partnerships

- RHK Technology, Inc. (vendor, close collaboration on instrument development)
- Wisconsin MRSEC on Nanostructured Materials and Interfaces (AFM will be used for research on nanostructured high temperature ceramics)
- NSF CMS (AFM will be used for research funded by CAREER Award to PI Carpick)